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INFLUENCE OF THE WASTE COMPOSITION ON THE PROPERTIES OF PAPER SHEETS

The paper studies the influence of the properties of the waste paper on the properties of a paper sheet. The obtained data demonstrate the ability of different types of waste to the dissolution and grinding. It has been shown that paper properties such as breaking length, absorbency at unilateral wetting, elongation, wet strength, breaking force of various types of fibrous materials recycled fibrous materials must be taken into consideration in paper and cardboard mills in the manufacture of paper and cardboard with a different field of application. It is concluded that the selected samples of waste paper can be recycled in paper mills of the Republic of Belarus as fibrous raw material to produce various kinds of paper.

Inroduction. The production of paper and cardboard from recycled cellulose materials (waste) is growing rapidly, about 2 times faster than the production of paper from the primary semis [1].

The variety of waste paper raw material requires specification of the conditions for its recycling at paper and cardboard plants taking into consideration its fractional composition and paper-forming properties.

Domestic paper and cardboard enterprises process a variety of waste paper raw materials, the suppliers of which are companies and organizations of Russia, Belarus, Latvia and other countries. However, at present there are no systematized data about the composition and properties of the waste paper used to produce a wide range of paper and cardboard products with sufficiently large technological difficulties.

One of the main reasons is unstable paper-forming properties due to the heterogeneity and multiple processing. To develop practical recommendations for the rational utilization of a particular brand of paper waste systematized data on the influence of waste on the properties of a paper sheet are of interest. To carry out researches at the BSTU "Bellesbumprom" Concern handed the University waste paper WP-1, WP-2, …, WP-13.

Main part. The purpose of this work is to study the paper-forming properties of waste paper raw material depending on its suppliers.

In the laboratory of the department of Chemical Wood Processing the book-forming properties of waste paper supplied to "Bellesbumprom" Concern by the Republic of Belarus, Russia and Latvia, were investigated. Waste paper of the following grades was used: WP-4A, WP-5B, WP-6B, WP-7B, WP-8B, WP-9B, WP-11B and WP-13B. For this purpose we got pulp of waste paper.

Dissolution of waste paper was performed for 10 min in a disintegrator brand BM-3. The dissolved 4% fibrous pulp was ground in a mill brand BAT-3 of LCR-1 set. Plant fibers in the grinding process were subjected to mechanical impact, swelling and fibrillation. Hydroxyl groups on the fiber surface are involved in the formation of interfiber forces [2, 3], which increases the strength of paper.

First of all, the degree of grinding (Y_1) and the weighted average fiber length (Y_2) for the obtaining of the fiber suspension were determined. Then samples of paper were made from the obtained fibrous suspension, the weight of one square meter of which being 80g. Their quality was evaluated by such indicators as breaking length (Y_3), wet strength (Y_4), absorption at unilateral wetting (Y_5), elongation when dry (Y_6), elongation when wet (Y_7), breaking force in the dry state (Y_8), breaking force when wet (Y_9) and ash (Y_{10}) [4].

The testing of paper samples was performed with the use of a modern equipment available at the department of Chemical Wood Processing SCANR 38 and DIN 53112.

The Table shows the main characteristics of recycled stock (Y1, Y2) and the quality indicators of paper samples (Y3-Y10), depending on the brand of the waste paper.

The obtained data indicate that the following samples of waste paper possess the highest physical and mechanical properties: WP-6B (Republic of Belarus), WP-13B (Republic of Belarus), mixture WP-5B, WP-7B (Republic of Belarus), CUE "Ecores", Minsk , WP-5B (Russia, Voronezh), mixture WP-5B, WP-7B (republic of Belarus, Petrikov RAIPO), mixture WP-4A, WP-7B, WP-5B (Republic of Belarus, Rechitsa RAIPO), WP-5B (Russia. CJSC "Gotek", Zheleznogorsk), mixture WP-5B, WP-7B (Republic of Belarus, Zhlobin), WP-5B (Russia, LLC "Eco-Logistic", Moscow).

Basic Characteristics of recycled stock (Y_1, Y_2) and the quality indicators of the produced paper samples (Y_3–Y_{10}) depending on the brand of the waste paper

Waste paper brand	Supplier	Y_1, °ShR	Y_2, dg	Y_3, m	Y_4, %	Y_5, g/m^2	Y_6, mm	Y_7, mm	Y_8, kgs	Y_9, kgs	Y_{10}, %
WP-14	Latvia	30	0.50	2,500	3.80	125	2.90	0.08	4.20	5.00	17.60
Mixture WP-4A, WP-7B, WP-5B	Republic of Belarus, Rechitsa RAIPO	29	0.80	3,590	1.40	156	4.30	0.06	2.50	6.00	3.10
WP-5B	Russia, LLC “STP”, Novozybkov	13	0.90	2,275	1.60	153	2.50	0.04	3.70	5.50	3.70
	Russia	22	1.30	2,885	3.20	162	3.10	0.10	4.30	7.00	2.00
	Russia, JSC “Global Trade”, Voronezh	16	1.30	5,050	5.70	188	5.60	0.32	2.60	5.50	2.00
	Russia, LLC “Impulse”, Smolensk	31	1.00	3,260	9.10	123	3.10	0.28	2.30	5.00	8.50
	Russia, CJSC “Gotek”, Zheleznogorsk	15	2.00	4,600	2.60	194	5.40	0.14	2.50	7.50	2.90
	Russia, JSC ”Eco-Logistic”, Moscow	21	1.20	4,650	2.40	180	5.70	0.14	2.70	5.50	6.30
	Republic of Belarus	24	1.10	3,410	8.70	151	3.70	0.32	3.90	7.00	2.60
Mixture WP -5B, WP-7B	Republic of Belarus, Gomel	30	0.75	1,935	1.00	106	1.70	0.08	2.80	5.00	11.30
	Republic of Belarus, JSC “Rumb”, Minsk	24	0.90	2,825	4.00	117	3.50	0.07	3.30	3.00	4.80
	Republic of Belarus, CUE “Ecores”, Minsk	29	1.10	4,160	1.70	125	4.60	0.08	4.20	6.50	2.90
	Republic of Belarus, Petrikov RAIPO	27	1.30	5,325	1.60	164	6.30	0.10	4.00	6.50	3.80
	Republic of Belarus, Minsk	31	0.60	2,360	3.10	172	2.60	0.08	2.20	8.00	6.50
	Republic of Belarus, Zhlobin	28	0.90	3,905	5.30	126	4.10	0.22	3.10	6.00	3.70
WP-6B	Republic of Belarus	24	1.00	4,745	5.30	115	4.90	0.26	4.00	5.00	6.90
	Republic of Belarus	28	1.10	3,725	6.30	142	4.10	0.26	3.70	5.00	7.80
WP-7B	Russia	21	0.60	545	2.80	90	0.50	0.02	3.50	6.00	8.70
	Russia (ЦВ)	19	0.75	605	2.00	169	0.90	0.01	2.80	5.00	14.50
	Republic of Belarus, JSC “Belpromtara”, Baranovichi	24	0.90	1,165	4.10	176	1.50	0.06	3.80	5.00	18.20
	Republic of Belarus	22	0.90	3,040	3.40	171	4.10	0.14	3.70	10.00	6.70
	Republic of Belarus	20	0.50	2,940	3.80	171	3.70	0.14	4.60	7.00	8.10
	Republic of Belarus	20	1.00	2,785	6.60	140	3.10	0.20	4.50	10.00	12.50
Mixture WP-7B. WP-8B	Russia	35	0.70	3,015	6.90	147	3.20	0.22	4.20	5.00	9.70
	Republic of Belarus	20	0.90	2,175	5.20	163	2.20	0.08	4.30	4.00	25.80
WP-8B	Republic of Belarus	30	0.90	2,195	0.80	143	2.50	0.02	3.20	3.00	23.40
WP-9B	Republic of Belarus	20	0.90	2,315	4.70	168	2.60	0.12	3.70	7.00	11.30
	Republic of Belarus. RUE “Svetlogorsk Khimvolokno”	22	0.90	2,340	5.40	161	2.20	0.12	2.20	7.50	11.50
WP-11B	Russia	21	0.90	1,640	6.50	120	1.50	0.10	3.60	6.50	5.90
WP-13B	Republic of Belarus. CUE “Spetskommuntrans”, Gomel	30	1.60	1,375	4,50	145	1.60	0.06	4.30	6.00	3.00
	Republic of Belarus	30	1.00	1,735	6,20	162	1.90	0,12	3.50	7.00	3,00
	Republic of Belarus	29	1.00	3,985	4.70	118	4.30	0.20	3.80	5.00	9.0

Conclusion. It is shown that a particular brand of waste paper (WP-1, WP-2, ... WP-13), depending on its supplier differs in fractional composition, degree of grinding and weighted average fiber length.

Therefore, in processing waste paper raw material at a particular enterprise it is necessary to take into consideration not only the peculiarities of the technological process of making paper and cardboard, but also the composition and properties of the recycled waste paper raw material.

The obtained data allow us to recommend a particular paper and cardboard mill of "Bellesbumprom" Concern to recycle the best brand of waste paper from which it is possible to produce paper and cardboard with high and stable physical and mechanical properties.

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